

BEYOND PEST TRAPPING: DEVELOPING A SYSTEM FOR MAPPING AND ANALYZING THE FAUNA OF COLLECTION SPACES.

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INTRODUCTION

The use of trapping as a method of monitoring is deeply embedded in the majority of the integrated pest management strategies employed by museums. Trapping can provide valuable information on the distribution of pests within collection areas, and the seasonal fluctuations in their populations. It can be used to identify and pinpoint the location of pest infestations, and to determine routes of entry into the collections. Finally, it can be used as a method of assessing the efficacy of new pest management strategies.

The potential of the information yielded by trapping studies to contribute to collection management and preventative conservation of collections is huge. Almost as great, however, is the *volume* of information generated, and the time needed to analyze it. That time increases exponentially if trapping records of other, non-pest invertebrate species are included in the analysis. Such species may be of little or no importance as agents of destruction, but may be valuable indicators of environmental problems in collection spaces (e.g. book mites as an indicator of damp¹).

There is an understandable tendency among collection managers to view collection spaces as sterile environments into which various species, usually pests, intrude. Given the correct combination of physical and chemical barriers these species can be excluded and sterility restored. Our belief is that collection storage areas have faunas, usually invertebrate, which are as distinctive as those of natural habitats, and which vary according to the environment of the storage area. Manipulating the environment of the storage area will change the composition of the fauna. If recorded and mapped, these changes can provide a test of both the effectiveness of both pest management strategies, and climate control.

Our long-term aim is to put into place a museum-wide system of trapping, which will run in tandem with environmental monitoring and provide a test of the efficacy of cleaning, pest management, and environmental control strategies. In order to do this, we need to develop a database capable of recording and displaying the trapping data in a useful format. This poster is a report on our progress to date.

¹ CCI, 1998. Psocids or "book lice": a warning of dampness. CCI Notes N3/4. Ottawa, Canadian Conservation Institute.

OBJECTIVES

To use information on the composition of the invertebrate fauna of collection spaces as a source of information on the environment of the collections, and as the basis for the development of preventative conservation strategies for the collections.

REQUIREMENTS

- A protocol for collecting information about trap sites in the collections.
- A routine for setting and retrieving traps in the collections.
- A database capable of storing, analyzing, and visually displaying a wide range of data resulting from the trapping of invertebrate species found in collection spaces.
- An underlying database on the invertebrate species themselves, to assist with interpretation of the data.

PROGRESS

A set of basic information for trap sites and trapping events has been identified and is described below. A prototype database has been written, which is capable of storing, retrieving, and mapping this information. Finally, a pilot study has been started in one building of the American Museum of Natural History, with the aim of developing trapping protocols and testing the database. This study has been running for around 9 months.

FUTURE DEVELOPMENTS

This project is still in a very early stage of development. Over the next year we will be seeking to build on a number of aspects of the database. These include:

Enhancement of Species Data

In co-operation with colleagues in the AMNH Division of Invertebrate Zoology, we will be seeking to add more information on environmental preferences. We are also considering whether to include images and information on diagnostic characters, so that the database can be used to assist identification. Publication of a hard copy pamphlet summarizing published information on species identification is another possibility.

Streamlining the Mapping of Data

The workload involved in setting up the system is comparatively high. We would like to reduce this burden through development of an easy user interface to fix new trap sites and to input and select new room maps. This would enable individual users to set up their own studies, rather than having to do this centrally, as we are currently doing.

Expanding the Scope of the Pilot Study

We are beginning to collect data from the lower level of Building 17. We will also be extending trapping to other areas of Mammalogy, and to other interested departments of the AMNH.

DATABASE OPERATION

The database is accessed from the Front Screen.



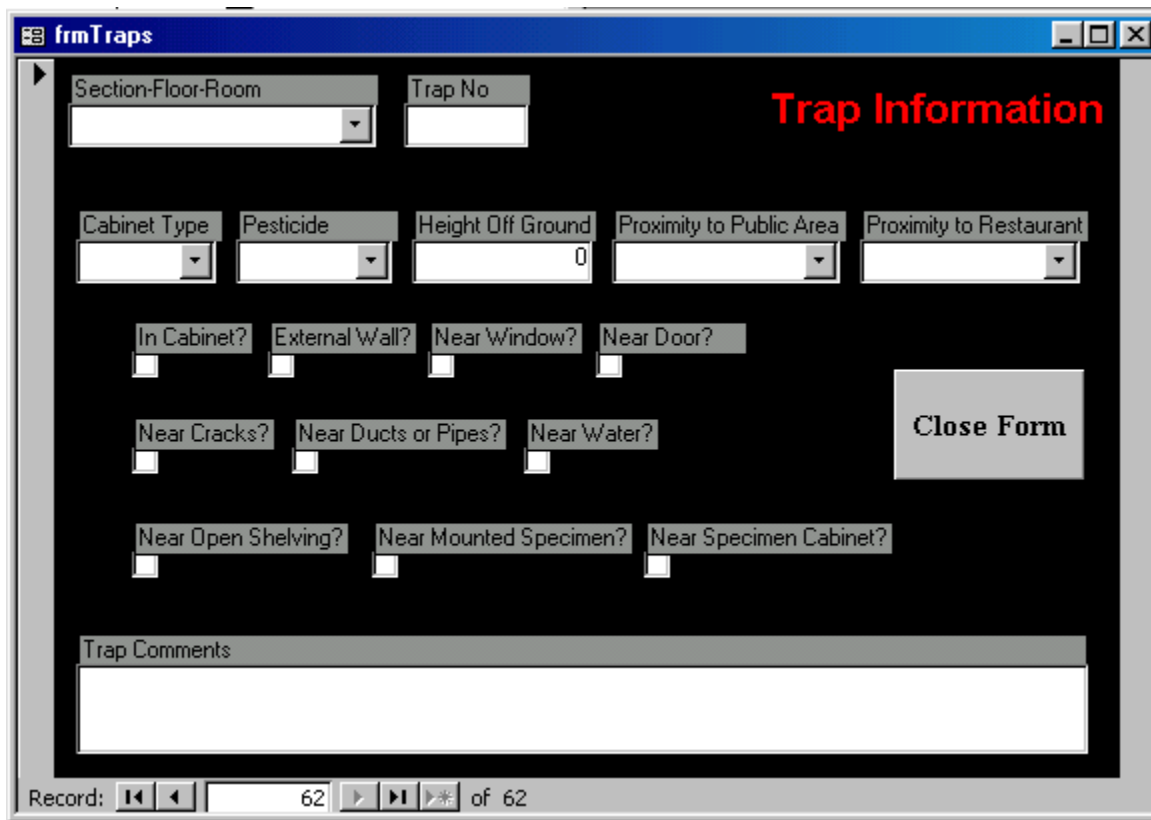
Figure 1: Database Front Screen

Four options are available by clicking on the buttons.

1. Enter or modify information on Trap Sites
2. Enter or modify information on Species Events
3. Query the database by Location.
4. Exit the database.

Entering or Modifying Trap Site Information

Trap site details are entered using the Trap Information Screen.



The screenshot shows a software window titled "frmTraps" with a dark background. The title bar includes standard window controls (minimize, maximize, close) and the text "frmTraps". The main area is titled "Trap Information" in red text. The form contains the following fields and controls:

- "Section-Floor-Room": A drop-down menu.
- "Trap No": A text input field.
- "Cabinet Type": A drop-down menu.
- "Pesticide": A drop-down menu.
- "Height Off Ground": A text input field with the value "0".
- "Proximity to Public Area": A drop-down menu.
- "Proximity to Restaurant": A drop-down menu.
- Seven checkboxes for environmental factors: "In Cabinet?", "External Wall?", "Near Window?", "Near Door?", "Near Cracks?", "Near Ducts or Pipes?", and "Near Water?".
- Three checkboxes for specimen-related factors: "Near Open Shelving?", "Near Mounted Specimen?", and "Near Specimen Cabinet?".
- "Trap Comments": A large text area at the bottom.
- "Close Form": A button on the right side.

At the bottom of the window, there is a record navigation bar showing "Record: 62 of 62" with navigation icons.

Figure 2. Trap Information Screen

To create a new Trap record:

1. The Building, Floor, and Number of the Room in which the trap is located are selected from a drop-down list in the "Section-Floor-Room" field.
2. The trap number is entered in the "Trap No." field.
3. If the trap is inside a cabinet, a cabinet type has to be selected from the drop-down list in the cabinet field. If the trap is outside the cabinet, "none" is selected as the cabinet type.
4. Any pesticide treatment applied within a 3m radius of the trap is selected from the options in the drop down list in the "pesticide" field.
5. The height of the trap above the ground (in meters) is entered in the "Height off Ground" field.
6. Proximity to restaurants and public areas are selected from a range of broad categories in drop down lists in the relevant fields.
7. Information about the surroundings of the trap is entered by selecting (or not selecting) each of the ten tick boxes on the form.

- Any additional information not covered by the previous fields can be entered as text in the comments field.

Recording Species Event Information

Information about species events is entered via the “Species Event” screen.

The screenshot shows a software window titled "frmPestEvents" with a blue background. The main heading "Species Events" is in a white box on the right. The form contains several input fields and a table. At the bottom, there is a "Close Form" button and a record navigation bar showing "Record: 1 of 145".

Trap: 17-1M-17, 2

Placed On: 7/21/00 Retrieved On: 10/6/00

Common Name: Moth Fly

Pest Taxonomy [Modify Taxonomy](#)

GenusName	FamilyName	OrderName	EcoType	Association
Psychoda	Psychodidae	Diptera	Pest	damp, drains

Quantity: 1 Dust Cover: [dropdown]

Species: [text] Lifestage: Adult [dropdown]

Comments: [text area]

Record: 1 of 145

To record a new species event:

- Trap number is selected from a drop down list linked to the “Trap Information” Table.
- The dates on which the trap was placed and retrieved are entered in the “Placed On” and “Retrieved On” fields respectively.
- The common name of the species captured is selected from a drop-down list in the “Common Name” field.
- If the common name of the species is not present on the list, a new species entry must be created. This is done by clicking on the “Modify Taxonomy” button.
- The “Modify Taxonomy” button opens the Species Information Table in a new window.

CommonName	GenusName	FamilyName	OrderName	EcoType	Association
American Cockroach	Periplaneta	Blattidae	Orthoptera	Pest	(none)
Black Carpet Beetle	Anthrenus	Dermestidae	Coleoptera	Pest	(none)
Blow Fly		Calliphoridae	Diptera	Nuisance	(none)
Book Lice	Liposcelis	Liposcelidae	Pscoptera	Indicator	damp, warmth
Centipede	Scutigera			Predator	(none)
Crane Fly		Tipulidae	Diptera	Nuisance	(none)
Fire Brat	Thermobia	Lepismatidae	Thysanura	Pest	(none)
Flesh Fly			Diptera	Nuisance	(none)
Fruit Fly	Drosophila	Drosophilidae	Diptera	Indicator	damp, decay
Fungus Gnat		Fungivoridae	Diptera	Indicator	damp, mold
House Fly			Diptera	Nuisance	(none)
Isopod				Indicator	(none)
Midge		Chironomidae	Diptera	Nuisance	(none)
Millipede				Nuisance	(none)
Mosquito		Culicidae	Diptera	Nuisance	(none)
Moth Fly	Psychoda	Psychodidae	Diptera	Indicator	damp, drains
Odd Beetle	Thylodius	Dermestidae	Coleoptera	Pest	(none)
Pavement Ant	Tetramorium	Formicidae	Hymenoptera	Nuisance	(none)
Phorid Fly		Phoridae	Diptera	Indicator	damp, decay

Close Form

Record: 1 of 24

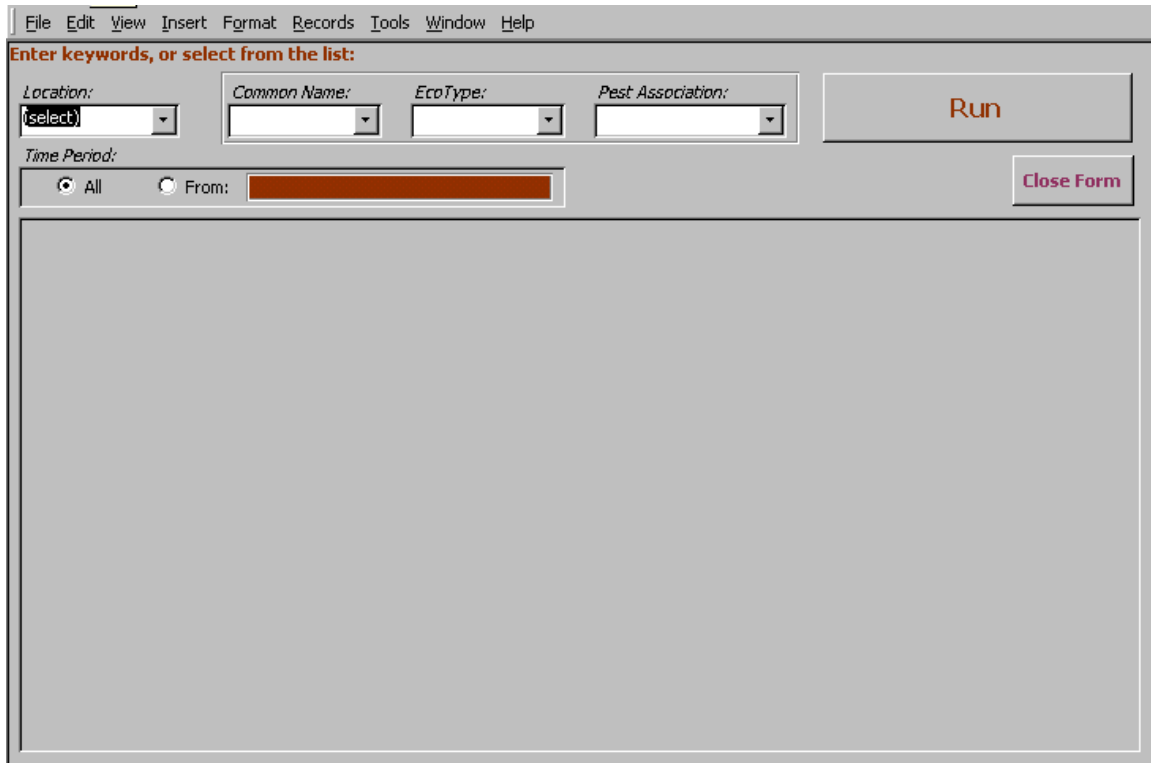
Figure 4: Species Information Table

Information on the taxonomy, ecotype, and associations of the species can be typed directly into the table. The only exception is the species name, which is entered separately in the “species” field of the screen.

6. The life stage of the species is entered in the “life stage field.” The number of individuals of that life stage present is entered in the “quantity” field.
7. An estimate of the dust cover present on the trap is made by selecting one of a series of broad categories from the drop down list in the “dust cover” field.
8. Any additional information not covered by the previous fields can be entered as text in the comments field.

Running A Query

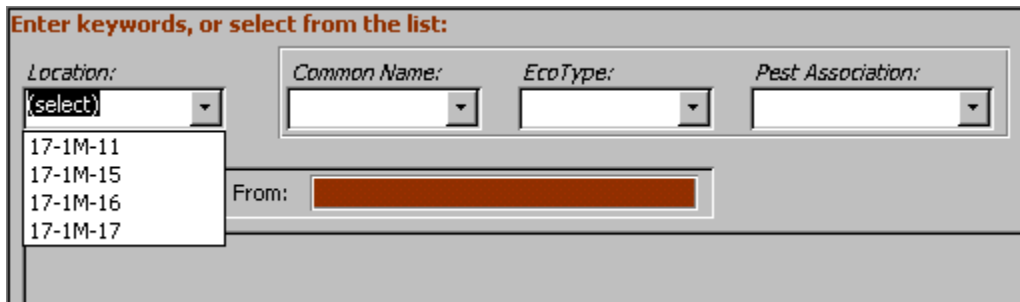
The main method of running queries on the database is via the Query Screen. This is accessed by clicking on the right hand button of the Front Screen.



The screenshot shows a software window titled "Enter keywords, or select from the list:". The window has a menu bar with "File", "Edit", "View", "Insert", "Format", "Records", "Tools", "Window", and "Help". Below the menu bar, there are four dropdown menus: "Location:" (with "(select)" selected), "Common Name:", "EcoType:", and "Pest Association:". To the right of these menus is a "Run" button. Below the "Location:" dropdown, there is a "Time Period:" section with a radio button for "All" (which is selected) and a "From:" label followed by a red rectangular input field. To the right of the "From:" field is a "Close Form" button. The main area of the window is a large, empty grey rectangle.

Fig 5: Blank Query Screen

The first stage in running a query is to select a room from the drop down menu at the left hand side of the Query Screen.



This screenshot shows the same "Enter keywords, or select from the list:" window as in Fig 5, but with the "Location:" dropdown menu open. The menu is displaying a list of room identifiers: "17-1M-11", "17-1M-15", "17-1M-16", and "17-1M-17". The "From:" input field is still present and empty.

Fig 6: Selecting a Room

Selecting a room from the drop down list will open a blank floor plan of that room.

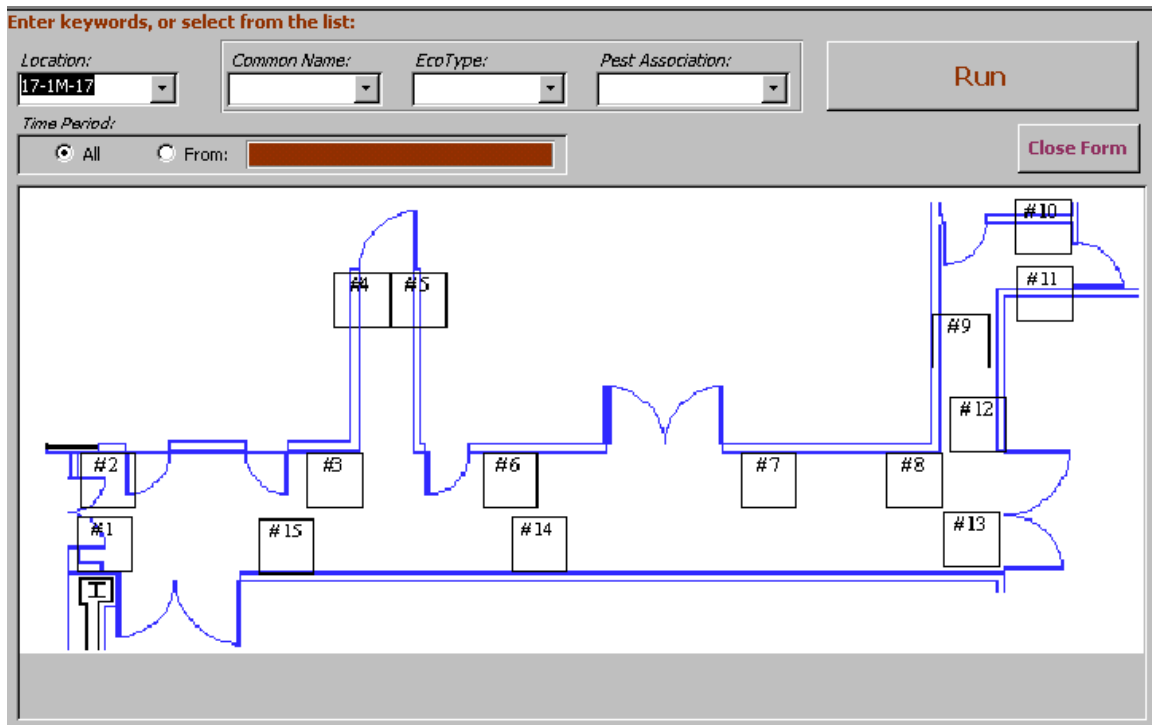


Fig 7: Blank Floor Plan

If the “Run” button is clicked with no further criteria entered, the program will show total captures per trap to date. Captures appear as purple numbers in the numbered trap boxes.

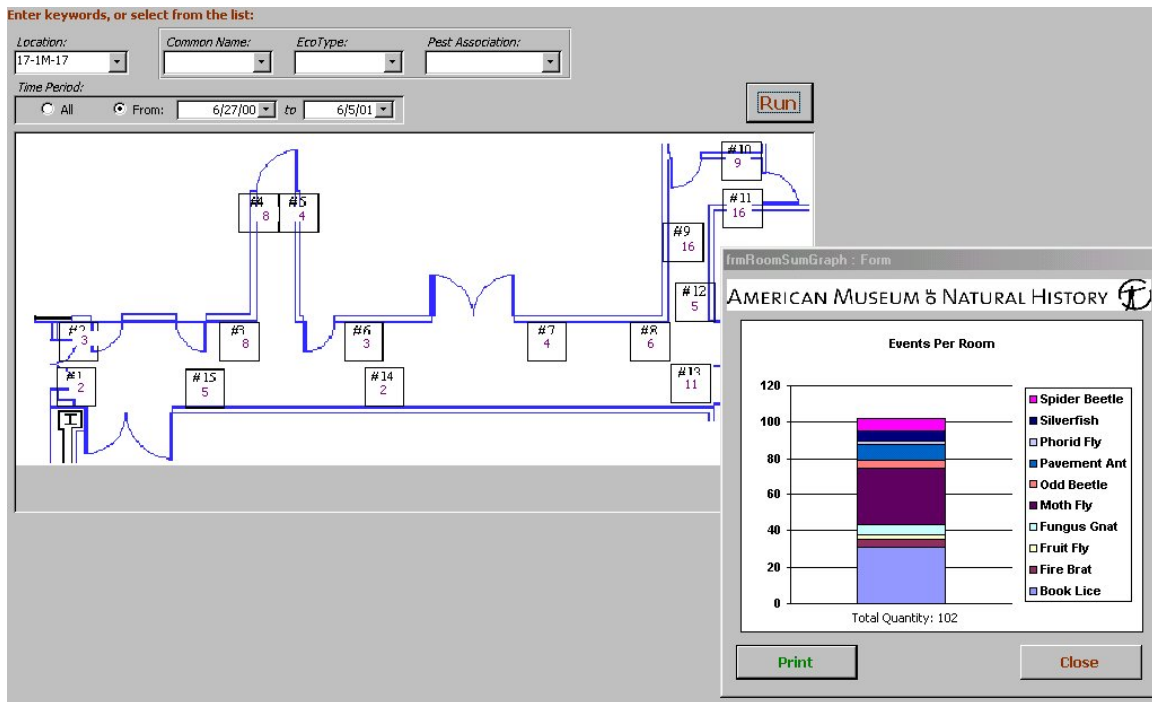


Fig 8: Results of “Total Captures to Date” query.

In addition, a new window opens, showing a column chart of total captures per species.

Double clicking on an individual trap will open a third window, with a chart showing captures by species for that trap.

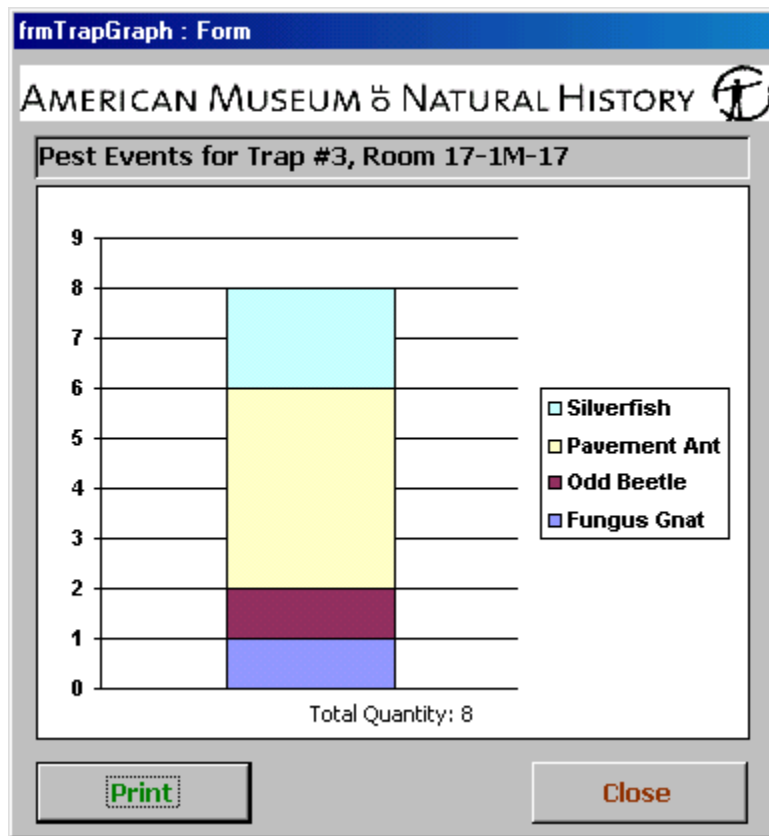


Figure 8: Results for one trap

Other criteria can be used to narrow the search. Checking the “From” box on the “Query Screen” allows searches to be made for captures between specified dates.

The screenshot shows a 'Time Period' section with two radio buttons: 'All' and 'From:'. The 'From:' radio button is selected. To its right is a date dropdown menu showing '6/27/00'. Further right is the word 'to' followed by another date dropdown menu showing '6/18/01'.

Figure 9: Query by Date

Drop down lists give options drawn from the “placed” and “retrieved” fields of the “Species Event” table for the “from” and “to” criteria respectively. Dates can also be typed directly into the boxes. The default date for the “to” field is always the current date.

Queries can also be run specifying common name, ecotype, or association. Once again, there are drop down lists of options, drawn from the relevant fields of the species table.

Enter keywords, or select from the list:

Location: 17-1M-17

Common Name: [Dropdown Menu]

EcoType: [Dropdown Menu]

Pest Association: [Dropdown Menu]

Time Period: All From: [Text Box]

[Search Box: #5]

- Book Lice
- Fire Brat
- Fruit Fly
- Fungus Gnat
- Moth Fly
- Odd Beetle
- Pavement Ant
- Phorid Fly
- Silverfish
- Spider Beetle

Figure 10. Drop Down List for “Common Name” Query

Alternately, all or part of a name or term can be typed into the box. For example, typing the word “Fly” into the “Common Name” field will show captures for fruit fly, moth fly, and phorid fly.

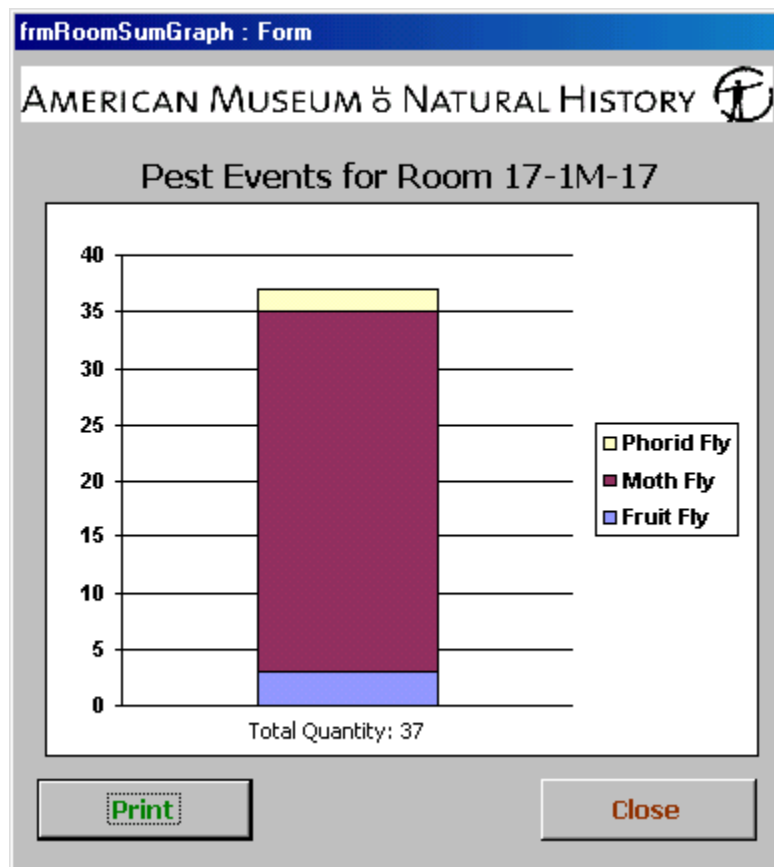


Figure 11: Results of Query on Common Name = “Fly”